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COMMISSION

INTERNATIONAL TSUNAMI INFORMATION CENTER

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TSUNAMI NEWSLETTER is published by the International Tsunami Information Center to bring news and information to scientists, engineers, educators, community protection agencies and governments throughout the world.

We welcome contributions from our readers.

The International Tsunami Information Center (ITIC) is maintained by the U.S. National Oceanic and Atmospheric Administration (NOAA) for the Intergovernmental Oceanographic Commission (IOC). The Center's mission is to mitigate the effects of tsunamis throughout the Pacific.

MEMBER STATES

Present membership of the IOC International Coordination Group for the Tsunami Warning System in the Pacific (ITSU) comprises of the following States:

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COLOMBIA
COOK ISLANDS
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA
ECUADOR
FIJI
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MEXICO
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PERU
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REPUBLIC OF KOREA
SINGAPORE
THAILAND
UNITED KINGDOM (HONG KONG)
USA
USSR
WESTERN SAMOA

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FEATURE

The Earthquake and Tsunami of 7-8 May 1986

By George Pararas-Carayannis
International Tsunami Information Center

An earthquake measuring 7.6 on the Richter Scale occurred at 2247Z on 7 May 1986, 100 miles southeast of Adak Island and approximately 70 miles southwest of Atka Village Alaska at 51.3N latitude, 175.0W longitude.

The earthquake generated a Pacific-wide tsunami which was recorded at tide stations throughout the Pacific. On the basis of tsunami confirmation at the Adak tide gauge station, a Regional Tsunami Warning was issued by the Alaska Tsunami Warning Center (ATWC) and a Pacific-wide Tsunami Warning by the Pacific Tsunami Warning Center (PTWC). The preliminary earthquake magnitude was determined by PTWC to be 7.8 and by ATWC to be 7.7. The National Earthquake Information Center (NEIC) revised the magnitude at a later time to 7.6. The earthquake epicenter was very close to the 9 March 1957, 8.3 magnitude earthquake (51.3N, 175.8W) which generated a Pacific-wide destructive tsunami that was particularly damaging in the Hawaiian Islands.

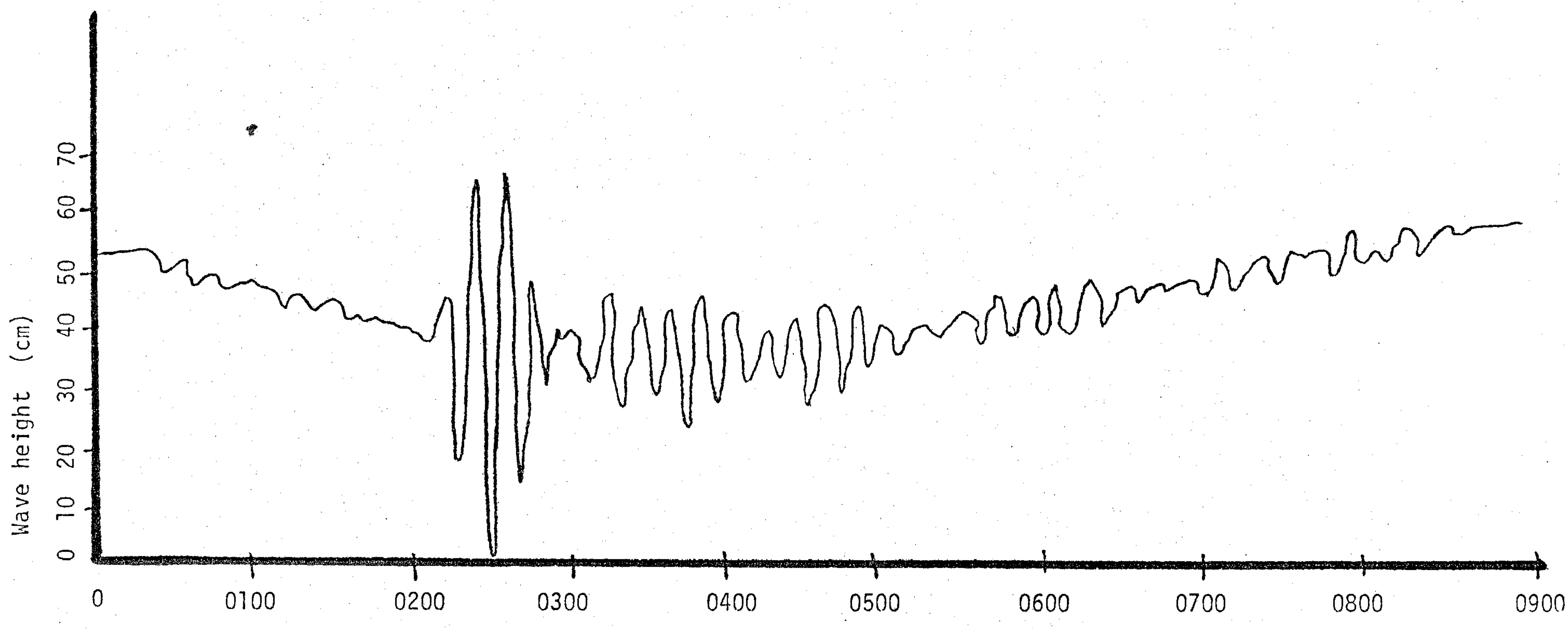
PTWC logs show the following activities: PTWC issued a Regional Tsunami Warning at 2315Z and on the basis of tsunami activity at Adak, issued a Tsunami Warning at 2351Z. Subsequent reports of sizable tsunami wave activity at Adak (1.75 m) and Midway (0.67 m) created concern about the potential of a destructive wave in the Hawaiian Islands, Japan and elsewhere. Fortunately a large destructive tsunami failed to materialize, and at 0510Z, PTWC cancelled the Warning with a statement that no destructive Pacific-wide tsunami had been generated but predicted that maximum 50 cm sea level fluctuations would be measured at some tide stations.

On an overall operational basis the performance of both ATWC and PTWC was excellent in providing timely tsunami warning services on a regional national and international basis. A review of the logs of PTWC shows that an epicenter location was obtained within 12 minutes of the origin of the earthquake. ATWC had already initiated procedures to implement a Regional Tsunami Warning for the near source region. Eighteen minutes later, when the seismic surface waves reached PTWC, the magnitude (MS) was determined. Inquiries to tsunami tide stations were issued within 27 minutes of the origin of the earthquake. A Regional Tsunami Watch Bulletin was issued within 28 minutes of origin and it was upgraded to a Tsunami Warning Bulletin within 64 minutes of the origin.

The following is a table showing the tsunami of 7-8 May 1986 as recorded or observed at different tide stations throughout the Pacific. The heights of tide gauge records are maximum wave oscillations from trough to crest.

Station	Lat.	Long.	Naut. Miles	Wave Height
Adak, Alaska	51°51'N	176°39'W	150	70-175 cm
Unalaska, Alaska	53°54'N	166°32'W	355	10- 25 cm
Sand Point, Alaska	52°20'N	160°30'W		10 cm
Crescent City, CA	41°45'N	124°12'W	2,129	rise followed 12 cm fall with 3 cm oscillations
Cape Scott Lighthouse (Vancouver Islands)	50°40'N	128°21'W		5 waves with max of 140 cm
Wake Island	19°17'N	166°37'E	2,093	5 waves: 3-10 cm
Neah Bay, WA	48°22'N	124°37'W	1,924	18 cm
Toke Point, WA	46°42'N	123°58'W		9 cm
Truk	07°22'N	151°53'E		6 cm
Apia, Western Samoa	13°48'S	171°46'W		5 cm
Johnston Island	16°45'N	169°31'W		3 cm
Port Lyttleton, NZ	43°37'S	172°43'E		40 cm
Washington State Coast				61-91 cm
Rarotonga, Cook Islands	21°11'S	159°46'W		3 cm
La Libertad, Ecuador	02°13'S	080°55'W		14 cm
Isla Lobos de Afuera, Peru	06°56'S	080°43'W		7 cm
La Punta, Peru	12°03'S	077°09'W		15 cm
Easter Island, Chile	27°09'S	109°27'W		9 cm
Valparaiso, Chile	33°02'S	071°38'W	7,384	25 cm
Coquimbo, Chile	29°56'S	071°20'W		45 cm
Midway Island	28°13'N	177°22'W	1,371	67 cm
Honolulu, Oahu, HI	21°18'N	157°52'W	1,955	40 cm
Hilo, HI	19°44'N	155°03'W	2,100	55 cm

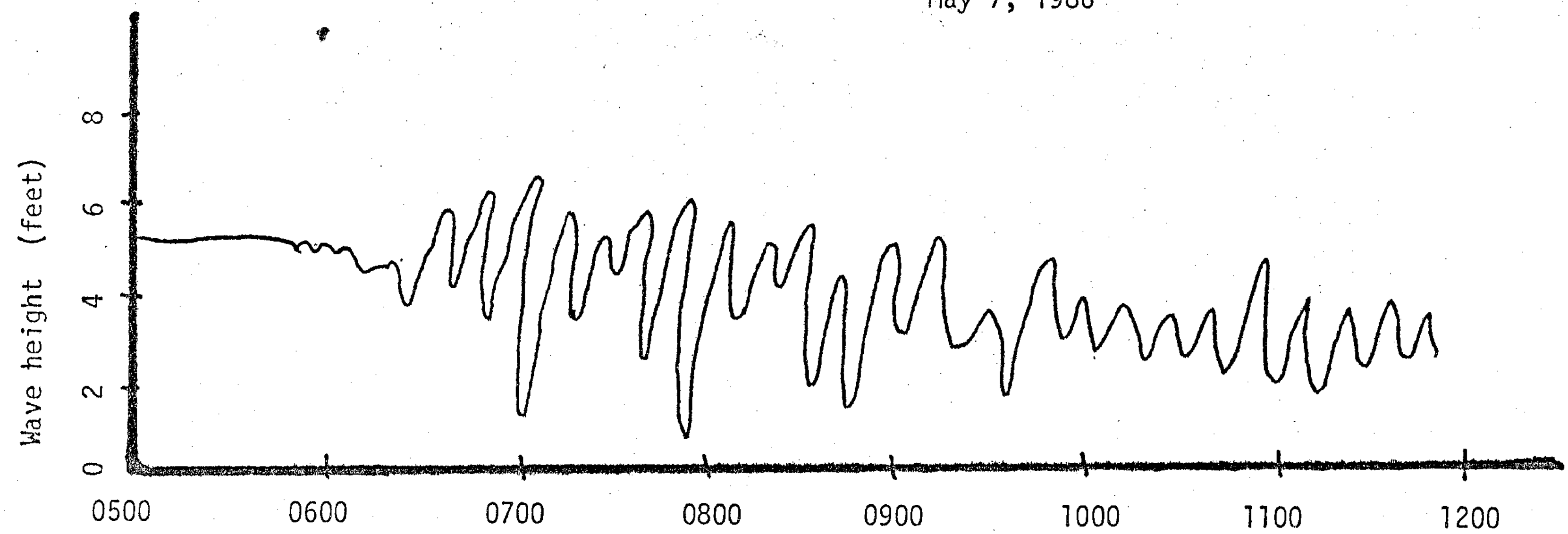
Tide Gage Record Showing Tsunami
Midway Island
May 7, 1986



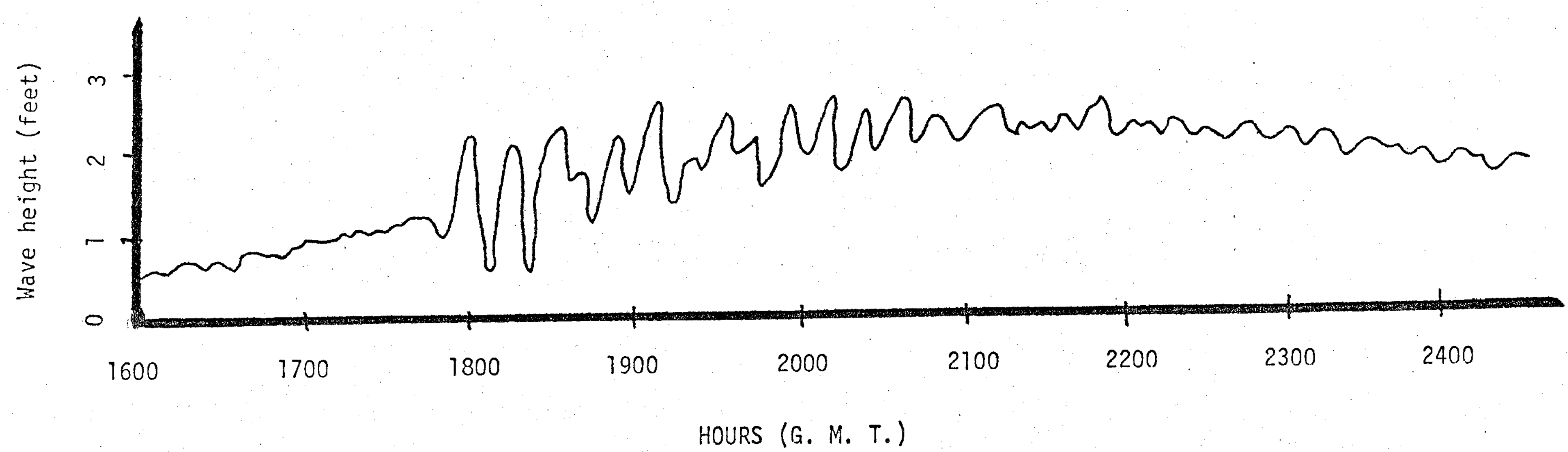
Station	Lat.	Long.	Naut. Miles	Wave Height
Kahului, Maui, HI	20°54'N	156°28'W	2,005	36 cm
Nawiliwili, Kaui, HI	21°57'N	159°21'W		78 cm
Honuapo, HI	19°05'N	155°53'W		18 cm
Kailua-Kona, HI	19°39'N	156°00'W		8 cm
Mahukona, HI	02°11'N	155°54'W		17 cm
Hanalei, Kauai, HI	22°13'N	156°30'W		61- 91 cm, observed
Kapaa, Kauai, HI	22°05'N	159°19'W		91-122 cm, observed
Miyako, Japan	24°48'N	125°17'E		10 cm
Ofunato, Japan	39°04'N	141°43'E		9 cm
Yakuta, Alaska	59°33'N	139°44'W		0 cm*
Kodiak, Alaska				0 cm*
Petropavlosk, USSR	53°01'N	158°39'E		0 cm*
Oregon State coastline				0 cm*
San Francisco, CA	37°48'N	122°28'W		0 cm*
La Jolla	32°52'N	117°15'W		0 cm*
Shimizu, Japan	32°47'N	132°58'E		12 cm
Pago Pago, Amer. Samoa	14°17'S	170°41'W		2 cm

*No wave activity

Tide Gage Record Showing Tsunami
Adak, Alaska
May 7, 1986



Tide Gage Record Showing Tsunami
Hilo, Hawaii
May 7-8, 1986



UPDATE - Tsunami Effects of the September 1985 Mexico Earthquake

Jane Preuss & Rolf Preuss
Urban Regional Research

Antonio Sanchez
Mexican Navy

Salvador Farreras
Centro de Investicacion Cientifica y de Education
Superior de Ensenada (CICESE)

Coastal effects of the 1985 earthquake impacted several communities in the general epicentral region from Playa Azul on the north to Zihuatanejo on the south. The impacted communities are the heavy industry-based city of Lazaro Cardenas with its industrially supported suburb of Guacamaya, the tourism-based communities of Ixtapa and Zihuatanejo which cater to tourists from Mexico City and North America, and Playa Azul which caters to tourists from Lazaro Cardenas.

The tsunami effects are briefly summarized below. Information is primarily based on a site inspection conducted in January 1986 by Jane Preuss and Rolf Preuss from Urban Regional Research; Salvador Farreras from Centro de Investicacion Cientifica y de Educacion Superior de Ensenada (CICESE); and Antonio Sanchez from the Mexican Navy.

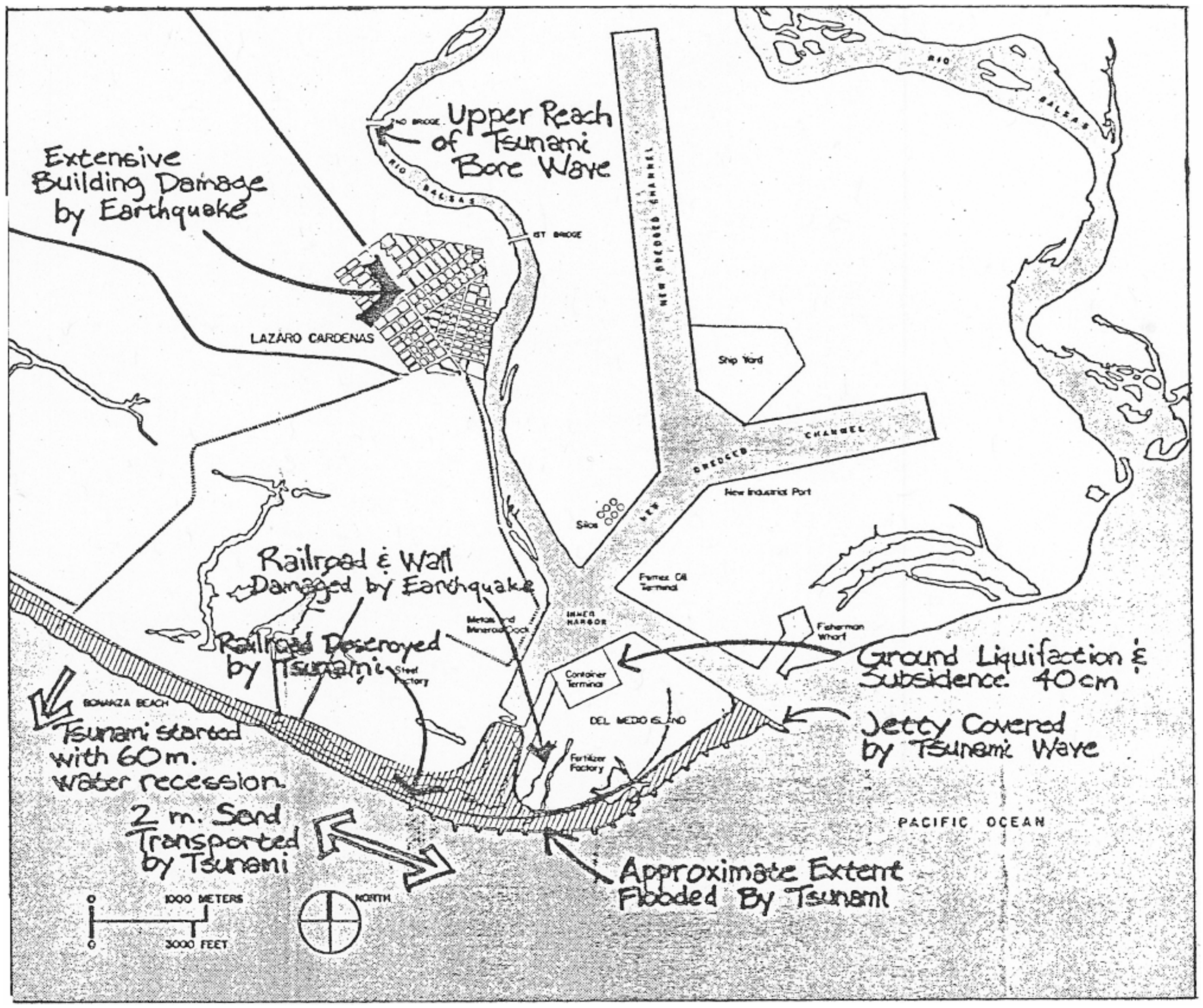
Lazaro Cardenas

The main industries in Lazaro Cardenas are a steel mill which employs about 7,000 people and a fertilizer plant which employs approximately 3,000 people. Over the last ten years the population of Lazaro Cardenas has grown from roughly 5,000 to an estimated 120,000 to 170,000. This dramatic growth is attributable to government investment in such industries as the Las Truchas steel mill, the Fertimex fertilizer plant and major port facilities.

The local tsunami which arrived during the earthquake shaking impacted the coastal area. The tsunami wave amplitude was approximately 2.5 meters and had a bore configuration. Its effects were observed as far as the second bridge on the River Balsas.

The damage caused by the tsunami affected infrastructural facilities supporting the fertilizer plant. For example, approximately 1.5 km of railroad tracks were destroyed because the bank under the tracks was eroded away. Rebuilding of the railroad is occurring immediately adjacent to the existing bed. An additional 2 km of railroad were destroyed by ground deformation. The only bridge providing access to the fertilizer plant was also destroyed. The fence protecting the railroad tracks from storm and tidal action was washed out. Beach configuration changes, attributable to approximately 2 meters of sand transport, were also observed.

There was approximately 40 cm of subsidence in the port which occurred in a filled area which had formerly been a small lake.



Lazaro Cardenas 1985 Earthquake Summary

Playa Azul

Playa Azul is a village located approximately 25 km north of Lazaro Cardenas. Its extensive beachfront restaurant facilities cater to tourists who are primarily from Lazaro Cardenas. The damage observed in

Playa Azul was caused by the tsunami. No effects of ground motions or ground failure were observed. The first tsunami wave arrived at the end of the shaking, approximately one minute later than in Lazaro Cardenas. The 2.5 m tsunami wave came inland approximately 100-150 m. It carried away restaurant furniture and deposited a ledge of sand approximately 25 m x 2 m at the upland edge of the beach. At the time of the site visit in January 1986, it appeared that virtually all the damage had been repaired, i.e. in response to the new beach configuration, the restaurants simply extended their floor area and the palapa roofs.

Ixtapa-Zihuatenjo Tourist Destination Area

The Ixtapa-Zihuatenjo tourist destination area is located south of Lazaro Cardenas. In Ixtapa it was reported that the water receded, then the entire bay filled up and the beach became "like a bath tub." The water came over a 1.5 meter wall and into the swimming pool of the Sheraton Hotel. In response to questions regarding people's behavior during the earthquake it was repeatedly reported that they ran out of the building toward the sea, only to find the sea rapidly coming towards them.

In Zihuatanejo the bay emptied, then there were 4 to 5 waves. Considerable damage was borne by the beachside restaurants which cater both to Mexican and U.S. tourists. It has also been reported that oyster beds and a farm for endangered turtles was destroyed in Zihuatanejo.

The damaged structures in Ixtapa and Zihuatanejo were more substantial than the ones in Playa Azul. Since the earthquake, the vacancy rate in the Ixtapa-Zihuatenajo destination area has been very high and even those hotels which suffered minimal damage have rented very few of their rooms. As a result there is a reduction in the support/hospitality personnel (cleaning staff, waiters, and small shops). The long term effects of the tsunami have therefore been attributable to economic effects of reduced tourism rather than to the building damage. Some of the hotel damage was to structures which had been damaged during previous earthquakes (e.g. Ixtapa). These structures were condemned and will not reopen. The remaining hotels were in the process of repair during the January site visit.

NEWS EVENTS

Earthquakes Rock Japan and New Guinea

A strong offshore earthquake hit central Japan on 24 June 1986, but caused no casualties or damages. The earthquake, measuring 6.9 on the Richter scale, struck at 11:53 a.m. (10:53 p.m. EDT on 23 June). The Japan Central Meteorological Agency located the epicenter to be in the Pacific Ocean and about 50 miles off the coast of Chiba and east of Tokyo. Japanese officials did issue a tsunami warning for a 560-mile stretch of coastline, but later cancelled it.

Within 18 minutes, a stronger earthquake registering 7.1 on the Richter scale rocked New Guinea. Don Finley of the U.S. Geological Survey said the quake was centered off the northern coast of New Guinea about 400 miles northwest of Port Moresby. The Pacific Tsunami Warning Center issued a statement that the location and magnitude of this quake were such that no tsunami generation was expected.

The following article is extracted from UNDRO NEWS, March/April 1986:

Are Earthquake Disasters Increasing?

by Vit Karnik

Every earthquake catastrophe initiates a new round of discussion. Questions are raised concerning the origin of earthquakes, the possibility of predicting them, the protection against their effects, and social and legislative measures. When several disastrous earthquakes occur in a relatively short period of time, questions concentrated on the possibility of an increase of both frequency and intensity of seismic phenomena; some even consider the likelihood of entering a period of cataclysms wth serious consequences for mankind.

To examine these questions, we first look to the past. Earthquakes have frightened people since early recorded time, and this is evident from old records, chronicles, and special publications concerning catastrophes, where earthquakes were usually reported together with storms, comets, epidemics and similar events affecting mankind. The reports have been studied, and catalogues on historical seismic events have been compiled. These observations belong to the cultural heritage of specific regions and inform on past disasters and their impact on societies. Although providing needed information, these catalogues do not give a complete picture of earthquake activity as a whole. It is important to note that earthquakes are not limited to populated areas, that they occur mostly in oceanic and mountainous regions, often relatively uninhabited areas, where their effects were not or could not be observed.

At the beginning of the twentieth century, seismographs were introduced. It was only with their advent that seismic events above a certain magnitude could be adequately recorded. Later improvements in the sensitivity of seismographs reduced the threshold, thus allowing at present a correct recording of all tremors worldwide measuring 4.5 or more on the Richter Scale. The present global network of seismological stations and work done by international seismological centers make it possible to compile complete catalogues of seismic events which provide an objective picture of the earth's seismic activity.

The catalogues compiled contain basic information concerning specific earthquakes. These include the time, the geographical co-ordinates of the epicenter, the depth of the focus (i.e.: the hypocenter), and the magnitude of the earthquake calculated by the procedure introduced by C. F. Richter.* For larger magnitude earthquakes, macroseismic intensity is estimated for localities affected. In this case, we often use macroseismic scales such as the Mercalli and the MSK; here the effects of the earthquakes are described in terms of twelve grades. Recently, additional parameters for describing earthquakes have been developed for those exceeding a magnitude of 5.5 on the Richter Scale. These parameters describe the fault and the movement along it, the accumulated stress, the size of the rupture, etc.

Even with such scientific advances, certain inconsistencies remain in the global catalogues. These reflect the lack of homogeneity of the input and of methods used for the determination of parameters. For this reason, much care must be used in standardizing procedures for processing earthquake observations.

Since 1963, a very good source of earthquake data has been the Bulletin of the International Seismogical Center (ISC) in Newbury, U.K. The Center regularly publishes regional catalogues, lists of felt and damaging earthquakes, and a bibliography of seismological publications in addition to providing other specialized services.

Recently, a Japanese seismologist, K. Abe, compiled a global catalogue for shallow earthquakes occurring from 1904-1980. (A shallow event is an earthquake which originates in the upper 60 kilometers, and a deep event originates from 70 to 750 kilometers below the surface.) Abe determined in a uniform way magnitudes for all earthquakes exceeding a magnitude level of 6.75, thus removing heterogeneities in classification. Therefore his catalogue is suitable for demonstrating long-term trends in global earthquake activity. Abe's catalogue was used for plotting the largest earthquakes observed in the 20th century (see Figure 1) with magnitudes exceeding 8.

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*The resulting figures are frequently referred to as the Richter Scale although this classification system is not a real scale with grades 1, 2, 3, etc. The figures calculated from amplitudes of seismic waves represent an objective measure of the "size" of an earthquake and can even be negative. Seismologists use the expression "magnitude of an earthquake is equal to ..." Sometimes they say "Richter magnitude." The largest earthquakes recorded in the 20th century reached the magnitude value of 8.9. The magnitudes are related to the amount of energy released in the form of seismic waves; sometimes this seismic energy is also used for comparing the size of individual earthquakes; until now the Richter magnitude has been most widely used as an objective measure of earthquake size.

In referring to Figure 1, it can be concluded that the frequency of earthquake activity varies and that during this century there were more large earthquakes before 1950 than after. Differences become even more apparent if the seismic energy released annually by tremors above 7.5 on the Richter Scale is calculated separately for shallow and deep events (see Figure 2). It is possible to estimate the amount of seismic energy E released by an earthquake by using an empirical relation between E and the Richter magnitude. Such an approach was used in compiling Figure 2. It must be noted, however, that other methods of seismic energy calculation may give slightly different results. In such a case, in Figure 2 the graph would probably change during the time period 1952-1965, and this portion of the graph would resemble the shape reached during the period 1904-1912. Still, the modified graph would continue to show a valid decrease in earthquake activity after 1971. It can be expected that the long-term balance of energy release may be re-established by a few extreme events during the period 1986-1995.

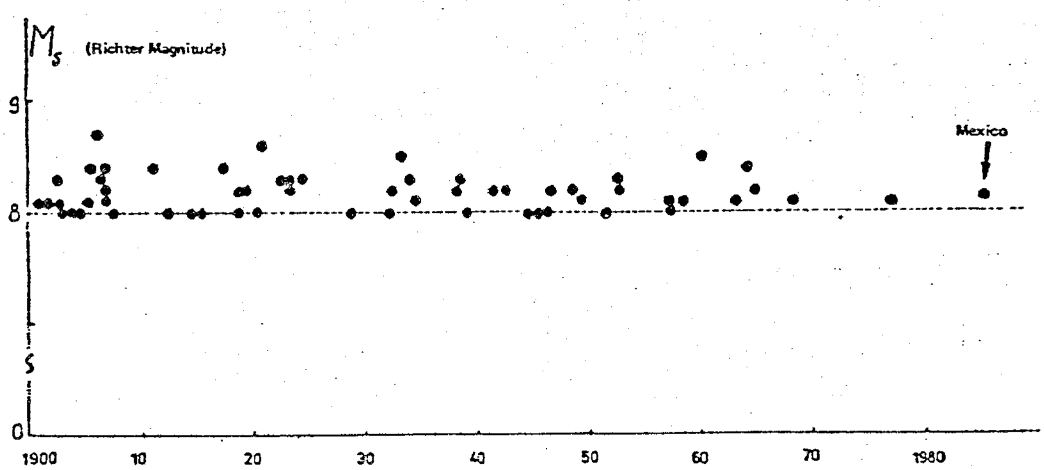

Figure 1

The reason for global variations in earthquake every release is not well understood. The origin is in slow movements of the rigid lithospheric plates. These form the upper most 60 to 80 kilometers of the earth and move very slowly over a more plastic substratum. They trigger earthquakes in regions where they collide or separate; consequently, these regions are known as seismic belts. Although these movements seem to be relatively steady, they are not equal. In addition, the mechanical properties of rocks at plate contacts vary from place to place. Owing to these two factors, the rate of global seismic energy release is not monotonous.

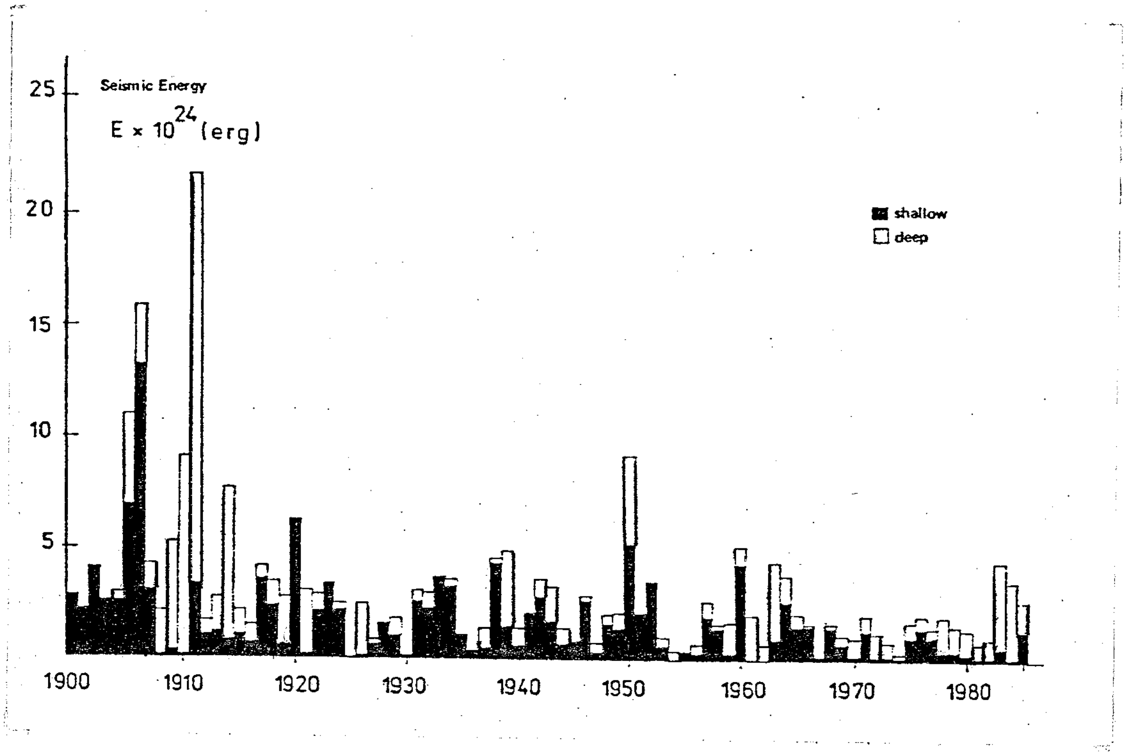

Figure 2

It is also important to note that since the earth is a celestial body, it is exposed to atmospheric and to outer space influences within our planetary system. Such influences may add small external forces to the plate movements that trigger earthquakes.

It can be concluded that during the 20th century there have been variations in global earthquake activity. The rate of seismic energy release was roughly stable between 1912 and 1970; there is a tendency towards a recent slow decrease rather than an increase. hence, it is not increasing earthquake activity that should be held responsible for growing losses of life and property. Instead, it is the expansion of human settlements that should take the blame. In UNDRO, the "earthquake hazard is the probability of an occurrence of damaging earthquake phenomena during a particular time interval" and "earthquake risk is the probability of loss due to hazard." Using these definitions, it can be stated that the earthquake hazard remains relatively stable, but the earthquake risk increases.

Earthquake risk is linked to the tremendous growth of large human settlements in earthquake-prone areas. Mexico City, struck by a recent earthquake, is a good example of a rapidly-developed capital, now with 28 million inhabitants, situated near an active earthquake belt.

Huge concentrations of populations have become very vulnerable to impacts of natural disasters and the responsible adminstrations should be more aware of social and economic consequences as well as of the need to apply all existing ways for reducing the adverse effects of disasters. Mexico City is not the only large town endangered by earthquakes; there are many others: Algiers, Tunis, Lisbon, Istanbul, Naples, Zagreb, Sofia, Bucharest, Teheran, Tokyo, Manila, Los Angeles, San Francisco, Lima, Guatemala, Managua, Caracas, Bogota, Santiago, Taipei, Djakarta, Tbilisi, Tashkent, mentioning only the largest ones in all continents. A statistical analysis of this problem was presented by V.I. Keilis-Borok et al. during the First Meeting of the International Working Group on Natural Disasters and Insurance organized in 1983 in Geneva jointly by UNDRO, UNESCO and the Geneva Association (see The Geneva Papers on Risk and Insurance, vol. 9, No. 32, 1984, 255-270).

Earthquakes are still not predictable on a routine basis. However, their effects can be reduced if proper pre-disaster preventive measures are enforced. Governments should learn more about disaster risks in their countries and about existing mitigation technologies which can substantially reduce future losses. Descriptions of technologies exist: UNDRO has covered this field in reviewed publications of the series on Disaster Prevention and Mitigation - A Compendium of Current Knowledge.

Thus the answer to the question in the title could be that the average number of large earthquakes will probably not increase but earthquake disasters will be more frequent with rate directly proportional to the growth of settlements in earthquake-prone areas. This tendency can be reversed only by efficient mitigation policies.

INTERNATIONAL TSUNAMI INFORMATION CENTER

Tsunami Warning System in Chile -- Standard Operating Plan

Dr. George Pararas-Carayannis, Director of the International Tsunami Information Center, in close collaboration with Mr. Emilio Lorca and other scientists at the Hydrographic Institute of the Chilean Navy and at National Emergency Office (ONEMI) have completed a pre-final draft of a Standard Operating Plan (SOP) for the National Tsunami Warning System in Chile. The SOP is composed of a basic plan outlining responsibilities and functions of governmental and non-governmental disaster agencies and a plan of implementation which includes emergency procedures, disaster assistance programs and appropriate coordinating instructions. A number of Annexes have been appended to the Basic Plan which outline in detail organizational infrastructure, Tsunami Hazard Analysis, Tsunami Warning Communications, Preparedness Measures, Public Information, Public Education, Disaster Reporting, and Tsunami Exercises.

The SOP prepared for Chile has been organized in a format that could be applied and adopted to the needs of other ITSU-Member States seeking to improve on their program of Tsunami Preparedness.

The final draft of the SOP is presently undergoing editorial review by the Hydrographic Institute of the Chilean Navy and ONEMI. Both of these organizations are working closely on the development of the specific evacuation plans and new procedures to be used initially for future tsunami warnings for the Valparaiso/Vina Del Mar areas. These specific procedures, once fully developed, will be included in the final SOP which is targeted for completion this summer.

For further information on the SOP please contact the Hydrographic Office of the Chilean Navy or the Director of ITIC (P.O. Box 50027/ Honolulu, HI 96850/USA).

ITIC Visitors

William R. Kramer	U.S. Fish & Wildlife, Honolulu
Susan Oshiro	News Reporter, Honolulu Advertiser
Tom Tanner	News Cameraman, KGMB-TV
Stacy Sakamoto	News Reporter, KGMB-TV
Mary Zanakis	News Reporter, KHON-TV
Ellen White	Honolulu, Hawaii
Jack Kampfen	Disaster Planner, Bank of Hawaii
Karl Cheng	Honolulu, Hawaii
Mary J. Perry	National Weather Service, Honolulu
Eileen M. Yoshino	National Weather Service, Honolulu
Naoko Adams	Honolulu, Hawaii
Teresa Madriaga	Donor Recruiter, Blood Bank of Hawaii
Thomas Tan	Summer Assistant, ITIC, Honolulu
Janet Tsuda	Honolulu, Hawaii
Barbara Rosa	Honolulu, Hawaii
Penny Ropes	Red Cross, Honolulu

IOC—ITSU

The Democratic People's Republic of Korea Joins ICG/ITSU

On 1 June the Democratic People's Republic of Korea has joined the International Coordination Group for the Tsunami Warning System in the Pacific. The contact address is the following:

Mr. Jong Young Gu
National Oceanographic Commission
Hydrometeorological Service
P.O. Box 100
Pyongyang
DPR of Korea

Editorial Group Met to Discuss Tsunami Time Charts

An editorial group of five experts, composed of Dr. Iouri Oliounine of IOC, Dr. T. Murty of Canada, Dr. Vladimir Shaidurov of the USSR, Mr. Gordon Burton of the USA, and Dr. George Pararas-Carayannis, Director of ITIC, met on 28-29 March 1986 at ITIC in Honolulu to review the development of tsunami travel-time charts.

Dr. Shaidurov of the Computer Center, Academy of Science of the USSR in Krasnojarsk, has agreed to prepare tsunami travel-time charts for locations in Chile, Colombia, Ecuador, Fiji, Guatemala, Hong Kong, Peru, Singapore, a total of 23 charts.

Dr. Shaidurov stated that the calculation technique is subject to concrete geomorphological characteristics of the sea bottom. Two approaches in developing isochrone charts have been considered: the first one is based on conventional numerical methods of solving eikanal equation in the spherical system of co-ordinates to calculate the perturbation propagation along the ray; another one realizes the main provisions of the Guigence principle on perturbation propagation in heterogeneous media and suggests measuring the local time of perturbation propagation along elementary trajectory segments.

The Meeting recommended the following:

1. The Meeting agreed on the following proposals for the format of the charts:

    a. No decimals should be assigned to isochrones, only round figures.

    b. Base maps should be sent to the Computer Center in USSR by the Director, ITIC with English text.

    c. Each chart should have in the text of the legend, limits of confidence, which is of special importance for local tsunamis.

    d. Charts should not have state boundaries and names of Member States. There will be only one chart for Honolulu with the Member States names and boundaries which will also contain the complete network of tsunami tide gauges.

    e. Chart legends should be translated by the IOC into English, Russian, and Spanish.

2. The need for more accurate bathymetric data, and changing the grid of calculations from one square degree to five square minutes, to increase the accuracy of the travel time charts.

3. The Secretary IOC consider the possibility of extending the contract with the Computer Center to develop 10 more charts for Honiara (Solomon Islands), Rabaul (New Britain), Kushiro (Japan),

Sydney & Cairns (Australia), Marsden (New Zealand), Petropavlovsk & Iturup (USSR) and Pusan (South Korea).

For further information, the Summary Report of the Editorial Group Meeting is available for review from ITIC.

11th Edition of the Tsunami Communication Plan to be Published

The 11th edition of the Communication Plan for the Tsunami Warning System is scheduled to be published by the end of this year, pending funding. Several major changes will be made to the Plan according to Gordon Burton, compiler, of the Pacific Tsunami Warning Center (PTWC). The new edition will include ITSU participants who were not included in the previous 10th edition, such countries as the Democratic People's Republic of Korea (who recently joined ICG/ITSU), People's Republic of China, Guatemala, Colombia, Republic of Korea, and Australia. The new edition will also be totally restructured and reorganized. The seismological stations, tidal stations and dissemination agencies will be arranged together by countries instead of separately by stations.

NATIONAL & AREA REPORT

Seismograph Installed at the Instituto Hidrografico de la Armada

The seismograph donated by the Pacific Tsunami Warning Center (PTWC) is assembled and undergoing tests to receive seismic data. The Hydrographic Institute plans to have the seismograph functioning continuously and in any situation, in the near future.

List of National Contacts of ICG/ITSU

The following is a list of National Contacts of ITSU members on file in the ITIC office. Please inform ITIC if there are any changes.

Australia	Mr. P. F. Noar Assistant Director (Services) Bureau of Meteorology GPO Box 1289 K Melbourne, Victoria 3001
CANADA	Mr. W. J. Rapatz Regional Tidal Superintendent Institute of Ocean Sciences Dept. of Fisheries and Oceans P. O. Box 6000 Sidney, B. C. V8L 4B2, Canada

CHILE	Captain Fernando Espinosa Simonetti Director Instituto Hidrografico de la Armada Casilla 324 Valparaiso, Chile
CHINA	Mr. Luo Yuru Director National Bureau of Oceanography of the People's Republic of China Beijing, China
COLOMBIA	Capitan de Fragata Ernesto Cajiao Secretario General Comision Colombiana de Oceanografia Apartado aereo No. 28466 Bogota, D.E., Colombia
COOK ISLANDS	Commissioner H. R. Melrose Police National Headquarters P. O. Box 101 Rarotonga, Cook Islands
ECUADOR	Calm. Fernando Alfaro Echeverria Director Instituto Oceanografico de la Armada Casilla 5940 Guayaquil, Ecuador
FIJI	Mr. A. Rahiman Director, Mineral Development Mineral Resources Department Private Mail Bag Suva, Fiji
FRANCE	Dr. M. Jacques Recy Directeur de la Recherche Office de la Recherche Scientifique et Technique Outre-Mer B.P. A5 Noumea Cedex (Nouvelle Caledonie) France
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ANNOUNCEMENTS

Natural and Man-Made Hazards Conference

An International Symposium on Natural and Man-Made Hazards will be held on 3-9 August 1986 at Rimouski and Quebec City, Canada. The International Symposium is the first one of its kind and it is expected to attract a number of scientists from all over the world. The meeting is co-sponsored by numerous international organizations, such as the Tsunami Society, the International Union of Geodesy and Geophysics (IUGG), the International Association for the Physical Sciences of the Oceans (IAPSO), the Regional Center for Seismology for South America (CERESIS), the United Nations Office of the Disaster Relief Coordinator (UNDRO), UNESCO Marine Sciences, the Canadian Oceanographic and Meterological Society (COMS), Emergency Planning Canada (EPC), and Urgence-Quebec. The Intergovernmental Oceanographic Commission (IOC) and the International Tsunami Information Center (ITIC) are also co-sponsors. The meeting is sponsored by the University of Quebec. Dr. Mohammed El-Sabh of the Department of Oceanography is the coordinator.

The Symposium is divided into several sections on geological hazards, storm surges, swells and sea waves, sea levels floods, droughts, ice and icebergs, man's intervention in the marine environment, climatic hazards, air and water pollutions, and tsunami hazards. The Tsunami Session is chaired by Dr. T. S. Murty (Canada). Dr. George Pararas-Carayannis, Director of ITIC is co-chairman. A total of seven papers will be presented in this section.

For more information regarding the Symposium and for copies of the proceedings contact:

Dr. Mohammed El-Sabh
Department d' Oceanonographic
Universite du Quebec a Rimouski
310, avenue des Ursulines
Rimouski (Quebec)
CANADA
G5L 3A1

Tel: (418) 724-1755
Telex: 051-31623

Sea the Future:--Perspectives in Ocean Technology Symposium Opens in Vancouver, Canada 12-14 September 1986

This International Symposium opens the nine days of EXPO 86's Underwater and Offshore Resources Period focusing on the practical challenges of ocean exploration and development.

Combining a retrospective and prospective approach, leading authorities will assess the future of ocean technology and resource development. Their discussion will include economic, cultural and national/international policy dimensions of ocean exploration and use.

The Symposium is open to anyone who works in or has an interest in ocean technology and development. For registration form and additional information, please contact:

Sea the Future
Box 48975 Bentall P.O.
Vancouver, British Columbia
Canada V7X 1A8

Telephone: (604) 688-9122
Telex: 04-508-562 Sea The Future

PTC '87

The 9th Annual Forum of the Pacific Telecommunications Council will be held 18-21 January 1987. Its focus will be on user requirements, how they are being met today and what the needs are for the future. Represented will be large organizations, small business and residential users from Asia, the Americas and Oceania. User interaction with carriers, suppliers, governmental officials and academics will explore technical, regulatory, economic and social factors affecting the implementation and utilization of telecommunications facilities and services, such as telephone, data networks, electronic mail, telex, video, broadcast-information services, local area networks, leased circuits, ISDN, standards, etc.

For more information contact:

PTC '87
1110 University Avenue, Suite 308
Honolulu, Hawaii 96826
USA

Telephone: (808) 941-3789 & 949-5752
Telex: 7430550PTC

Offshore Technology Conference

The Nineteenth Annual Offshore Technology will be held at Houston's Astrodomain 4-7 May 1987. The OTC is the foremost international forum in the offshore industry for reviewing current technologies and accomplishments and introducing new and evolving technologies. Papers are invited. Papers that present substantive contributions in the form of actual experience, laboratory or field data, or significant analytical or numerical solutions to problems are favored over papers that offer speculation, promises, or undue commercialism. For more information contact:

J. Kim Vandiver
Chairman, Technical Program Committee
Offshore Technology Conference
P. O. Box 833868
Richardson, TX 75080-3868
USA

XVI Pacific Science Congress Will Convene 20-30 August 1987

The XVI Pacific Science Congress will be held in Seoul, Korea from 20-30 August 1987. Pre-registration forms must be received before 31 December 1986. Please sent them to the address below:

Prof. Choon Ho Park
Secretary-General
Organizing Committee
XVI Pacific Science Congress
K.P.O Box 1008
Seoul 110
KOREA

For further information and pre-registration forms write to the above address.

Strong-Motion Earthquake Data Available

The Strong-Motion Earthquake Data Base contains 365 earthquakes from 1933-86 that occurred in 16 different countries or island groups, including Japan, Papua New Guinea, New Zealand, Fiji Islands, Solomon Islands, Italy, Rumania, U.S.S.R., United States, Chile, El Salvador, Mexico, Nicaragua, Peru, People's Republic of China, and Taiwan.

Strong-motion instruments record the horizontal and vertical acceleration of potentially damaging earthquakes. These instruments are triggered only by earthquake acceleration that is above a specific level (usually 2 percent of gravity). In contrast, observatory seismographs have magnifications of as much as 1 million and commonly record moderate earthquakes occurring throughout the world. The publication is available from:

National Geophysical Data Center
NOAA, Code E/GC4, Dept. F05
325 Broadway
Boulder, CO 80303

ABSTRACTS

Tsunami Propagation in Rivers of the Japanese Islands

Kuniaki Abe
Continental Shelf Research, Vol. 5, No. 6, pp. 665-77
1986
Reprint

On 26 May 1983 the rivers of the Japanese Islands were invaded by a tsunami from the Sea of Japan. Water levels in five large rivers were measured and were highest midway towards the uppermost point of inundation. The level at the uppermost point was approximately the same as that at the river mouths. As a result of resonance, a standing wave developed in the rivers. The period of the invading tsunami was found to be 80 min. This continental shelf oscillation resulted in a long-wave propagation of the tsunami.

The water levels showed another peak in the neighborhood of estuarine inflows. The period of this wave was estimated to be 20 minutes; its formation was attributed to generation near the tsunami source.

The cross-section and longitudinal profiles of the rivers, together with water flow, complicated the observed water level profiles.

The Configuration of the Philippine Sea and the Pacific Plates as Estimated from the High-resolution Microearthquake Hypocenters in the Kanto-Tokai District, Japan

Mizuho Ishida
Report of the National Research Center for Disaster Prevention
March 1986, pp. 1-19

[In Japanese]

The occurrence of large earthquakes in the Kanto-Tokai (K-T) District has been interpreted by the interaction among the Philippine Sea (PHS), the Eurasian (EUR) and the Pacific (PAC) plates. In this region, the PHS and PAC plates underthrust beneath the EUR plate.

As the first step for understanding the tectonic process taking place beneath the K-T region, we attempted to delineate the configuration of the PHS and PAC plates on the basis of the spatial distribution of microearthquakes. We used about 9,000 hypocenters of high resolution for the two-year period from 1983 to 1984 which were determined by the K-T Observational Network of the National Research Center for Disaster Prevention. Assuming that the upper surface of a descending slab is located about 10 km above the inclined seismic zone, we estimated the upper surface of the PHS and PAC slabs.

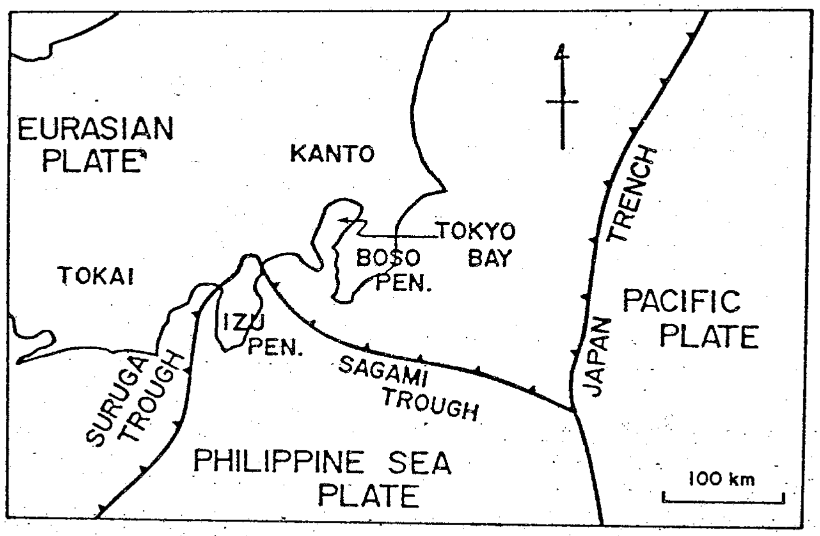

Plate boundaries among the Philippine Sea (PHS), Eurasian (EUR) and Pacific (PAC) plates in the Kanto-Tokai District (after Nakamura (1982)).

The contour lines of the upper surface of the PHS and the PAC slabs obtained in this study are about 10 to 20 km shallower than those obtained by other researchers. The PHS slab subducting from the Suruga trough is clearly traced from the south to the north but the northernmost tip in the inland area, where microearthquake activity is absent. The slab is again traced to the east from the northernmost tip of the Sagami trough. However, the contour line appears to be discontinued beneath Tokyo Bay, showing the change of the dip angle of the slab from the north to the south. The configuration of the PAC slab subducting form the Japan trench is much the same as those obtained by other researchers.

PACIFIC TSUNAMI WARNING CENTER

Seismic Summary (1 January 1986 to Press Time)

EVENT NO.	EVENT	LOCATION	ACTION TAKEN
1986-4	Apr 20 0704Z 6.6	Irian Jaya 01.5S 139.6E	No Earthquake Information Bulletin issued
1986-5	Apr 30 0707Z 6.6	West coast of Mexico 17.9N 102.8W	Issued Earthquake Information Bulletin
1986-6	May 7 2247Z 7.7	Adak, Alaska 51.3N 175.0W	Issued Tsunami Warning Bulletin and 5 Supplement Bulletins, including Cancellation Bulletin
1986-7	May 17 1620Z 6.9	Adak, Alaska 52.9N 174.8W	Issued Earthquake Information Bulletin
1986-8	May 20 0526Z 6.5	Taiwan 24.0N 121.3E	No Earthquake Information Bulletin issued
1986-9	June 18 0805Z 6.5	Adak, Alaska 51.9N 176.6W	No Earthquake Information Bulletin issued
1986-10	June 24 0311Z 7.1	Papua New Guinea 05.2S 143.3E	Issued Earthquake Information Bulletin